AbstractID: 11348 Title: An automatic method for reduction of metal artifacts caused by metallic implants

Purpose: To develop an automatic method for metal artifact reduction (MAR) from small objects such as brachytherapy (BT) seeds. **Method and Materials:** A phantom made of agar (water-like) and consisting of 6 slices of 5 mm in which 75 seeds (activity at background level) were implanted for imaging purposes. The phantom was scanned on a helical CT scanner (Siemens Somatom) to produce continuous 1 mm and 3 mm slices of the full phantom. The proposed method is based on the interpolation of missing projections by directly using raw CT data (sinogram). First, an initial image was reconstructed from the raw projection data. Then, the metal objects segmented from the reconstructed image were re-projected into the same sinogram. The Steger method was used to precisely determine the position and edges of the seed traces in raw CT data. By combining the use of Steger detection and re-projections, the missing projections were finally detected and further replaced by interpolation of non-missing neighbouring projections. **Results:** In both phantom experiment and patient studies, the missing projections have been well detected and the artifacts caused by metallic objects in the image reconstructed using the corrected sinogram have been significantly reduced. The performance of the algorithm has been also proven after a quantitative evaluation by comparing the intensity uniformity between the uncorrected and corrected phantom images. **Conclusion:** An efficient algorithm for MAR in seed brachytherapy was developed. The challenge of detecting and correcting artifacts from 60 to 120 tiny objects in sinogram space has been successfully demonstrated. The detected traces can be further processed to extract, from a large sample of points, the position and orientation of each seed with high precision. This should enable a more accurate use of advance brachytherapy dose calculations, such as Monte Carlo simulations.